WHAT IS CLAIMED IS:

1. A channel allocation method in a CDMA (Code Division Multiple Access) communication system, comprising the steps of:

receiving from a UTRAN (UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network) one SF (Spreading Factor) node $C_{SF,k}$ out of 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

searching a group including the received SF node $C_{SF,k}$ in accordance with the Formula (1) below;

spreading a signal on a dedicated physical data channel (DPDCH) with an OVSF (Orthogonal Variable Spreading Factor) code corresponding to a selected one of the received SF node and its child nodes in the searched group; and

spreading a signal on a dedicated physical control channel (DPCCH) with an OVSF code corresponding to an SF node determined by Formula 2A if the n of the received SF node is the first half value halving $\frac{2^{m-1}}{4}$ and Formula 2B if the n thereof is the latter half value halving the same.

Formula (1)

$$\text{For SF} \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)$$

$$\text{For SF} > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)$$

where, $P_1 = \frac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \frac{4 \cdot SF}{2^{m-1}}$.

Formula (2A)

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)$$

Formula (2B)

$$F(C_{\frac{2^{m-1}}{4}k}) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)$$

2. The channel allocation method as claimed in claim 1, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for a control part is SF=256, a spreading factor $C_{control,256,127-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,255-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with Formula (3) below.

Formula (3)

$$F(C_{data,64,k})=C_{control,256,127-k}$$

$$F(C_{data,64,32+k})=C_{control,256,255-k}$$

where k=0,1,2,3,....,23.

3. The channel allocation method as claimed in claim 1, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for a control part is SF=256, a spreading factor $C_{control,256,96+k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,224+k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with Formula (4) below.

Formula (4)

$$F(C_{data,64,k})=C_{control,256,96+k}$$

$$F(C_{data,64,32+k})=C_{control,256,224+k}$$

where k=0,1,2,3,....,23.

4. The channel allocation method as claimed in claim 1, wherein in the case where a spreading factor in the SF node $C_{SF,k}$ is SF=128 and an associated spreading factor for a control part is SF=256, when k in a spreading factor $C_{data,128,k}$ of the DPDCH is an even number, a spreading factor of the DPCCH is mapped according to Formula (5) below; when the k is an odd number, the spreading factor of the DPCCH is mapped according to Formula (6) below; when k in a spreading factor $C_{data,64,32+k}$ of the DPDCH is an even number, the spreading factor of the DPCCH is mapped according to Formula (7) below; and when the k is an odd number, the spreading factor of the DPCCH is mapped according to Formula (8) below.

Formula (5)

$$F(C_{data,128,k})=C_{control,256,127-k}$$

Formula (6)

$$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n},$$

(for $0\leq n\leq 7$)

Formula (7)

$$F(C_{data,128,64+k})=C_{control,256,255-k}$$

Formula (8)

$$F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})= C_{control,256,207-n},$$

(for $0\leq n\leq 7$)

where k=0,1,2,3,...,23.

5. An uplink channel transmission apparatus for a user equipment (UE) in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UTRAN;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$ according to Formula (9) below, selecting one node for a data part out of the received SF node and associated child nodes from the searched group, and selecting an SF node for a control part determined by Formula 10A if the n of the received SF node is the first half value halving $\frac{2^{m-1}}{4}$ and Formula 10B if the n thereof is the latter half value halving the same;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH corresponding to the selected SF nodes of the data part and the control part;

a DPDCH spreader for spreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH spreader for spreading a signal on the DPCCH with the generated OVSF code for the control part.

Formula (9)

$$\text{For SF} \leq \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)$$

$$\text{For SF} > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)$$

where, $P_1 = \frac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \frac{4 \cdot SF}{2^{m-1}}$.

Formula (10A)

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)$$

Formula (10B)

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)$$

6. The uplink channel transmission apparatus as claimed in claim 5, wherein if a spreading factor in the SF node $C_{SF,k}$ is SF=64 and an associated spreading factor for the control part is SF=256, a spreading factor $C_{control,256,127-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,k}$ of the DPDCH, and a spreading factor $C_{control,256,255-k}$ of the DPCCH is mapped to a spreading factor $C_{data,64,32+k}$ of the DPDCH in accordance with Formula (11) below.

Formula (11)

$$F(C_{data,64,k})=C_{control,256,127-k}$$

$$F(C_{data,64,32+k})=C_{control,256,255-k}$$

where k=0,1,2,3,....,23.

7. The uplink channel transmission apparatus as claimed in claim 5, wherein in the case where a spreading factor in the SF node $C_{SF,k}$ is SF=128 and an associated spreading factor for the control part is SF=256, when k in a spreading factor $C_{data,128,k}$ of the DPDCH is an even number, a spreading factor of the DPCCH is mapped according to Formula (12) below; when k is an odd number, the spreading factor of the DPCCH is mapped according to Formula (13) below; when k in the spreading factor $C_{data,64,32+k}$ of the DPDCH is an even number, the spreading factor of the DPCCH is mapped according to Formula (14) below; and when k is an odd number, the spreading factor of the DPCCH is mapped according to Formula (15) below.

Formula (12)

$F(C_{data,128,k})=C_{control,256,127-k}$

Formula (13)

$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\leq n\leq 7$)

Formula (14)

$F(C_{data,128,64+k})=C_{control,256,255-k}$

Formula (15)

$F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})= C_{control,256,207-n}$, (for $0\leq n\leq 7$)

where k=0,1,2,3,...,23.

8. An uplink channel transmission apparatus for a UTRAN in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UE;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$ according to Formula (16) below, selecting one node for a data part out of the received SF node and associated child nodes from the searched group, and selecting an SF node for a control part determined by Formula 17A if the n of the received SF node is the first half value halving $\frac{2^{m-1}}{4}$ and Formula 17B if the n thereof is the latter half value halving the same ;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH

corresponding to the selected SF nodes of the data part and the control part;

a DPDCH despreader for despreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH despreader for despreading a signal on the DPCCH with the generated OVSF code for the control part.

Formula (16)

$$\text{For } SF \le \frac{2^{m-1}}{4},\ (P_1 \cdot SF,\ P_1 \cdot k) = \left(\frac{2^{m-1}}{4}, n\right)$$

$$\text{For } SF > \frac{2^{m-1}}{4},\ \left(P_2 \cdot \frac{2^{m-1}}{4},\ P_2 \cdot n\right) = (SF, k)$$

where, $P_1 = \frac{2^{m-1}}{4 \cdot SF}$ and $P_2 = \frac{4 \cdot SF}{2^{m-1}}$.

Formula (17A)

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-k-1} \quad (k = 0,1,\ldots)$$

Formula (17A)

$$F(C_{\frac{2^{m-1}}{4},k}) = C_{2^{m-1},2^{m-1}-(k-32)} \quad (k = 0,1,\ldots)$$

9. A method for assigning a first OVSF code and a second OVSF code which respectively spread data signals and control signals, in a mobile communication system having an OVSF code wherein 2^m-1 SF nodes are arranged in the form of a tree in m+1 column and the SF nodes are divided into a pair of trees having first and second half SF nodes obtained by halving first SF nodes in a column corresponding to a maximum SF, the method comprising the steps of:

each tree allocating an OVSF code corresponding to one of some SF nodes in an

$m+1^{th}$ column which becomes child nodes of one node out of second SF nodes following the first SF nodes as the first OVSF code for spreading a control signal; and

allocating the second OVSF code corresponding to one of the remaining nodes which maintain orthogonality with said one of the second SF nodes to spread a data signal.

10. The method as claimed in claim 9, wherein the maximum SF node is $C_{4,k}$ (where k=0,1,2,3), the first SF nodes include $C_{4,0}$ and $C_{4,2}$, the second SF nodes include $C_{4,1}$ and $C_{4,3}$, the second SF node $C_{4,1}$ includes child nodes $C_{8,2}$ and $C_{8,3}$, the second SF node $C_{4,3}$ includes child nodes $C_{8,6}$ and $C_{8,7}$, the child nodes $C_{8,3}$ and $C_{8,7}$ are allocated as the second OVSF code for spreading the control signal, and the remaining nodes are allocated as the first OVSF code for spreading the data signal.

11. The method as claimed in claim 10, wherein the first OVSF codes for spreading the data signal and the second OVSF codes for spreading the control signal are so allocated as to be mapped according to Formula (17) below.

Formula (17)

$$F(C_{data,64,k})=C_{control,256,127-k}$$

$$F(C_{data,64,32+k})=C_{control,256,255-k}$$

where a spreading factor of the data signal is SF=64, a spreading factor of the control signal is SF=256, and k=0,1,2,3,....,23.

12. The method as claimed in claim 10, wherein when k is an even number, the first OVSF codes for spreading the data signal and the second OVSF codes for spreading the control signal are mapped according to Formula (18) and Formula (20) below, and when k is an odd number, the first OVSF codes and the second OVSF codes

are mapped according to Formula (19) and Formula (21) below.

Formula (18)

$F(C_{data,128,k})=C_{control,256,127-k}$

Formula (19)

$F7(C_{data,128,2n+1})=F7(C_{data,128,2(n+8)+1})=F7(C_{data,128,2(n+16)+1})=C_{control,256,103-n}$, (for $0\leq n\leq 7$)

Formula (20)

$F(C_{data,128,64+k})=C_{control,256,255-k}$

Formula (21)

$F7(C_{data,128,64+2n+1})=F7(C_{data,128,64+2(n+8)+1})=F7(C_{data,128,64+2(n+16)+1})=\quad C_{control,256,207-n}$, (for $0\leq n\leq 7$)

where a spreading factor of the data signal is SF=128, a spreading factor of the control signal is SF=256, and k=0,1,2,3,...,23.

13. A channel allocation method in a CDMA (Code Division Multiple Access) communication system, comprising the steps of:

receiving from a UTRAN (UMTS (Universal Mobile Terrestrial System) Terrestrial Radio Access Network) one SF (Spreading Factor) node $C_{SF,k}$ out of 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

searching a group including the received SF node $C_{SF,k}$;

spreading a signal on a dedicated physical data channel (DPDCH) with an OVSF (Orthogonal Variable Spreading Factor) code corresponding to a selected one of the

received SF node and its child nodes in the searched group; and

spreading a signal on a dedicated physical control channel (DPCCH) with an OVSF code corresponding to an SF node based on the received SF node.

14. An uplink channel transmission apparatus for a user equipment (UE) in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UTRAN;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$, selecting one node for a data part out of the received SF node and associated child nodes from the searched group, and selecting an SF node for a control part based on the received SF node;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH corresponding to the selected SF nodes of the data part and the control part;

a DPDCH spreader for spreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH spreader for spreading a signal on the DPCCH with the generated OVSF code for the control part.

15. An uplink channel transmission apparatus for a UTRAN in a CDMA communication system, comprising:

a memory for storing 2^{m-1} SF nodes (where m is an integer larger than 3) arranged in the form of a tree having a mother node and child nodes;

an input unit for receiving one SF node $C_{SF,k}$ from a UE;

an OVSF code allocating device for searching a group including the received SF node $C_{SF,k}$, selecting one node for a data part out of the received SF node and associated

child nodes from the searched group, and selecting an SF node for a control part based on the received SF node;

an OVSF code generator for generating OVSF codes for a DPDCH and a DPCCH corresponding to the selected SF nodes of the data part and the control part;

a DPDCH despreader for despreading a signal on the DPDCH with the generated OVSF code for the data part; and

a DPCCH despreader for despreading a signal on the DPCCH with the generated OVSF code for the control part.